

Application Note

Environmental

Ionic surfactants are found in large quantities cleaning products such as dish detergent, floor cleaner, and car wash soaps. They are also major components in personal hygiene products such as toothpaste, shampoo and bodywash.

Sodium Lauryl Sulfate and Sodium Laureth Sulfate are both C12-C14 ionic surfactants, similar in structure. Sodium Laureth Sulfate has a tail of between 12-14 carbons attached to a sulfate group. In addition, Sodium Laureth Sulfate has a number of ethoxy groups (usually 3) between the carbon tail and the sulfate. Even though the sodium portion cannot be identified using GC/MS, the surfactants' hydrophobic tails can, using the Pyroprobe.

Sodium Lauryl Sulfate and Sodium Laureth Sulfate samples were heated to 300°C using the Pyroprobe in trapping mode interfaced to a GC/MS via a heated transfer line. The resulting chromatograms for both surfactants display C12-C14 alkenes and alcohols. In addition, Sodium Laureth Sulfate chromatogram contains C12-C14 chains with ethoxy groups attached, like Dodecyloxy Ethanol and Tetradecyloxy Ethanol.

Hair shampoo that uses Ammonium Lauryl Sulfate and Ammonium Laureth Sulfate as surfactants was also analyzed. Like the other surfactants, the shampoo chromatogram contains C12-C14 alcohols and alkenes, as well as Dodecyloxy Ethanol and Tetradecyloxy Ethanol from Ammonium Laureth Sulfate. Also detected in Sodium Laureth Sulfate, and the shampoo was dioxane, a carcinogen reported to be present in Laureth sulfates.

Instrument Conditions

Pyroprobe

Interface: 300°C for 3 minutes
Pyrolysis: 300°C for 30 seconds
Valve oven: 325°C
Trans. line: 325°C

Trap:
Rest: 50°C
Heat: 300°C for 30 minutes

GC/MS

Column: 30m x 0.25 mm 5% phenyl
Carrier: Helium, 50:1 split
Injector: 350°C
Program: 40°C for 2 minutes,
10°/min to 300°C
Mass range: 29 to 550 AMU

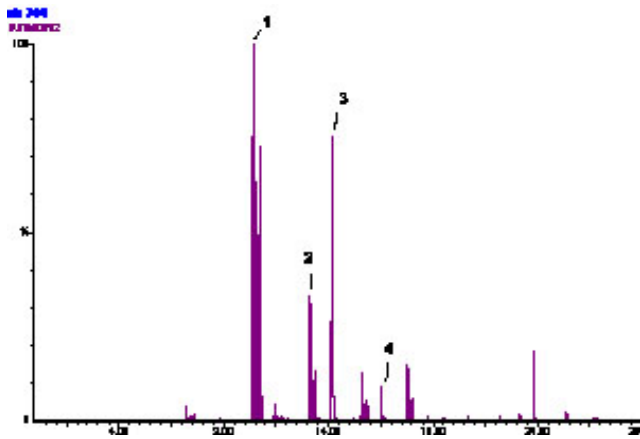


Figure 1: Sodium Lauryl Sulfate at 300°C.

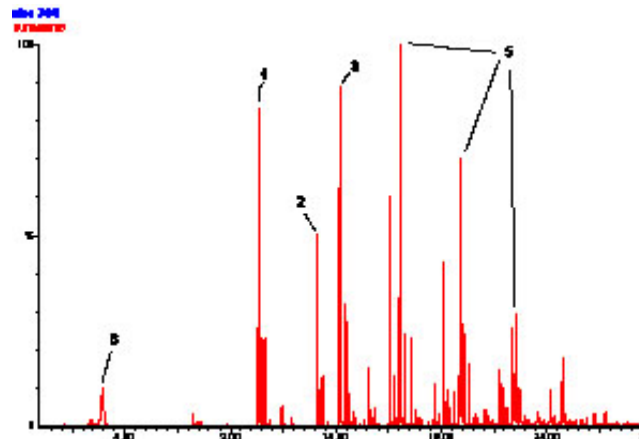


Figure 2: Sodium Laureth Sulfate at 300°C.

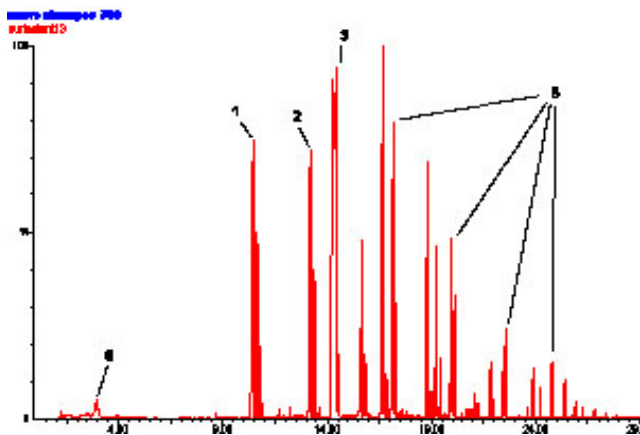


Figure 3: Hair shampoo at 300°C.

Peak No.	Identification
1	Dodecene
2	Tetradecene
3	Dodecanol
4	Tetradecanol
5	Glycol Ethers
6	1,4 Dioxane

FOR MORE INFORMATION CONCERNING THIS APPLICATION, WE RECOMMEND THE FOLLOWING READING:

T. H. Liddicoet and L.H. Smithson, Analysis of Surfactants Using Pyrolysis-Gas Chromatography, Journal of the American Oil Chemists' Society, 42 (1965) 1097-1102.